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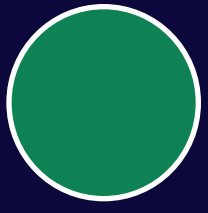
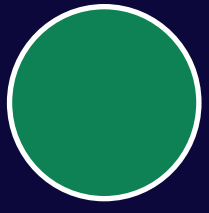
Transportation of U.S. Grains

A Modal Share Analysis 1978-2020 Update



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Transportation of U.S. Grains

A Modal Share Analysis 1978-2020 Update

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Abstract

This report provides a breakout by mode of corn, wheat, soybeans, sorghum, and barley movements to either domestic markets or U.S. ports for export between 1978 and 2020. It is the thirteenth update of an initial modal share study completed in 1992. The purpose of this series of reports is to provide the latest information about changes and trends in the relative competitiveness and efficiency among the different transportation modes in moving grain. Estimates of the tonnages (and shares) of grain railed, barged, and trucked are developed from a variety of secondary sources. This data can be used to identify trends and implications on transportation from factors, such as changes in production volumes and commodity mix, as well as changes in the relative demand for U.S. grain for domestic purposes versus export.

Contents

Introduction

The purpose of this analysis is to examine trends in the type of transportation used to move grains grown for the food and feed industry.[1] Grains produced in the United States move to domestic and foreign markets through a well-developed transportation system. Barge, rail, and truck transportation facilitate a highly competitive market that bridges the gap between U.S. grain producers and domestic and foreign consumers.

Barges, railroads, and trucks often compete head-to-head to supply transportation for grains. Despite a high degree of competition in some markets, these modes also complement each other. Before a bushel of grain reaches its final destination, it has often been transported by two or more modes. This balance between competition and integration provides grain shippers with a highly efficient, low-cost system of transportation. The competitiveness of U.S. grains in the world market and the financial well-being of U.S. grain producers depends upon this competitive balance. A highly competitive and efficient transportation system results in lower shipping costs, smaller marketing margins for middlemen, and more competitive export prices. Such efficiencies also result in lower food costs for U.S. consumers and higher market prices for U.S. producers.

This analysis of the transportation of the final movement of grain, by mode, provides information about changes in market share among the modes. Over several years, such work helps identify critical trends affecting the transportation of grain. It also provides a framework to assess public policies that influence the development and success of the Nation's transportation infrastructure. Public policies that promote an efficient grain transportation system also promote strong U.S. agricultural and rural economies.

Note to readers regarding past versions of this report: This update presents new data for 2020 as well as minor revisions to previous years.

[1] For this analysis, it is assumed that corn, wheat, soybeans, sorghum, and barley represent all grain movements.

Methodology

Any effort to measure tonnages of grain moved by mode of transport is limited by the absence of information on the total volume of truck movements. Accurate data exist for barge and rail freight tonnages and commodities, but not for trucks. Other analyses of grain movements have relied extensively on survey data to overcome this obstacle. This analysis uses the Waterborne Commerce Statistics of the U.S. Army Corps of Engineers to calculate tonnages of barged grain and uses the Carload Waybill Sample from the Surface Transportation Board to estimate the amount of railed grain. Trucking data are derived from known grain production data, as compared to the estimates of the railed and barged volumes of grain. Estimating these modal grain volumes and modal shares on an annual basis provides a data series that tracks changes in grain transportation over time.

In this analysis, the term "modal share" describes that portion of the total tonnages of grain moved by each mode of transport—barge, rail, or truck. These shares, expressed as percentages, were determined by mode for particular types of grains and movements. Grains identified for this analysis were corn, wheat, soybeans, sorghum, and barley. The 1992 and 1998 versions of this study also included rye and oats. Rye and oats were taken out of the calculations for this report because of unreliability due to small volumes, which total less than 1 percent of all grain movements. Transport modes are categorized according to the final movement going to domestic markets or ports for export.

The estimates of modal tonnages and shares are based on the amount of grain moved to commercial markets. Truck tonnages are estimated by subtracting barge and rail tonnages from total tonnages transported. Figure 1 shows how modal shares are estimated. For each crop, total movements are determined first, and then exports are subtracted from the total to get domestic movements. Total rail and barge volumes are subtracted from total movements to get truck movements. A more detailed description of the methodology is covered in Appendix A.

Figure 1: Estimating modal tonnages and shares

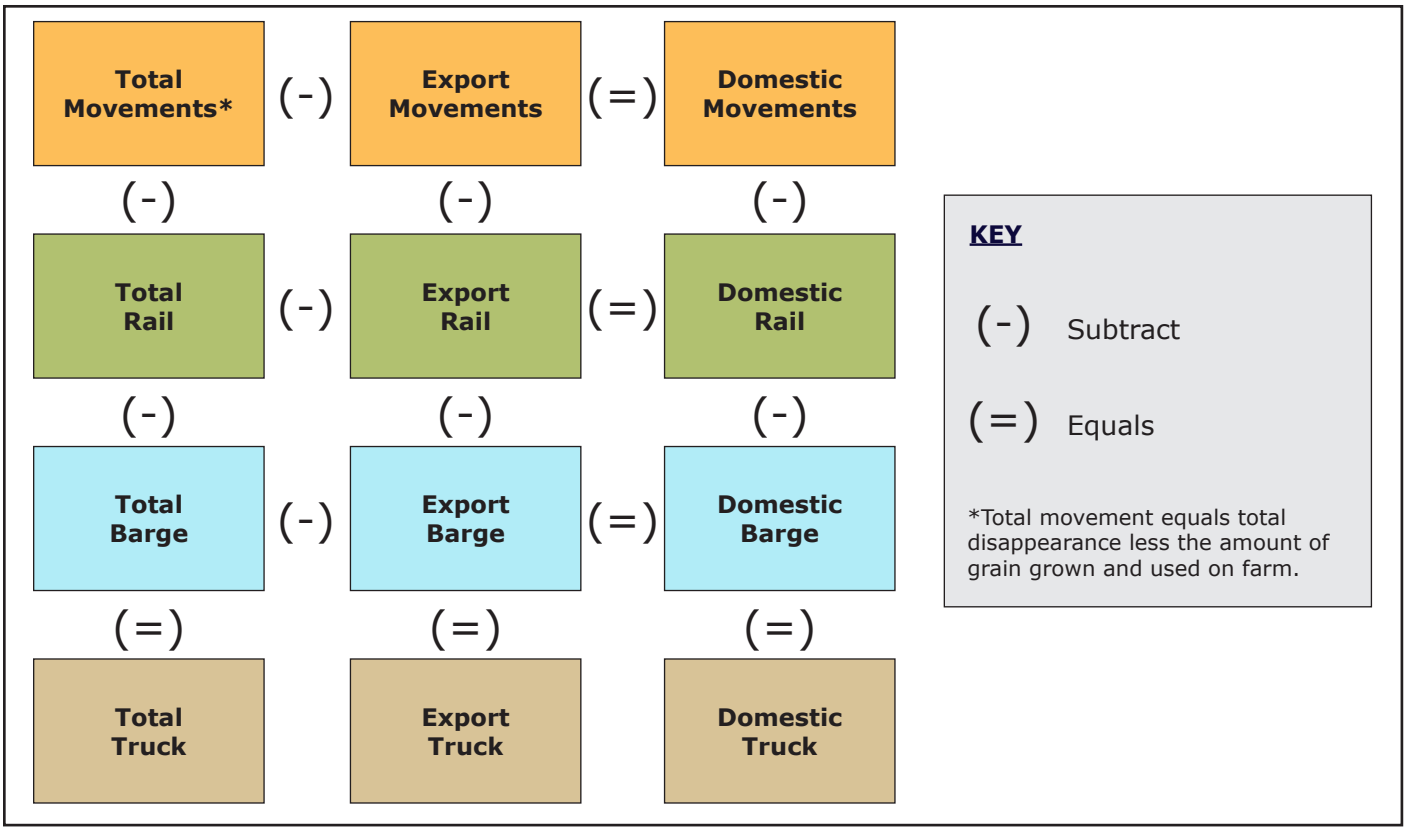


Figure 2: Total grain movements to domestic and export markets, 1978-2020

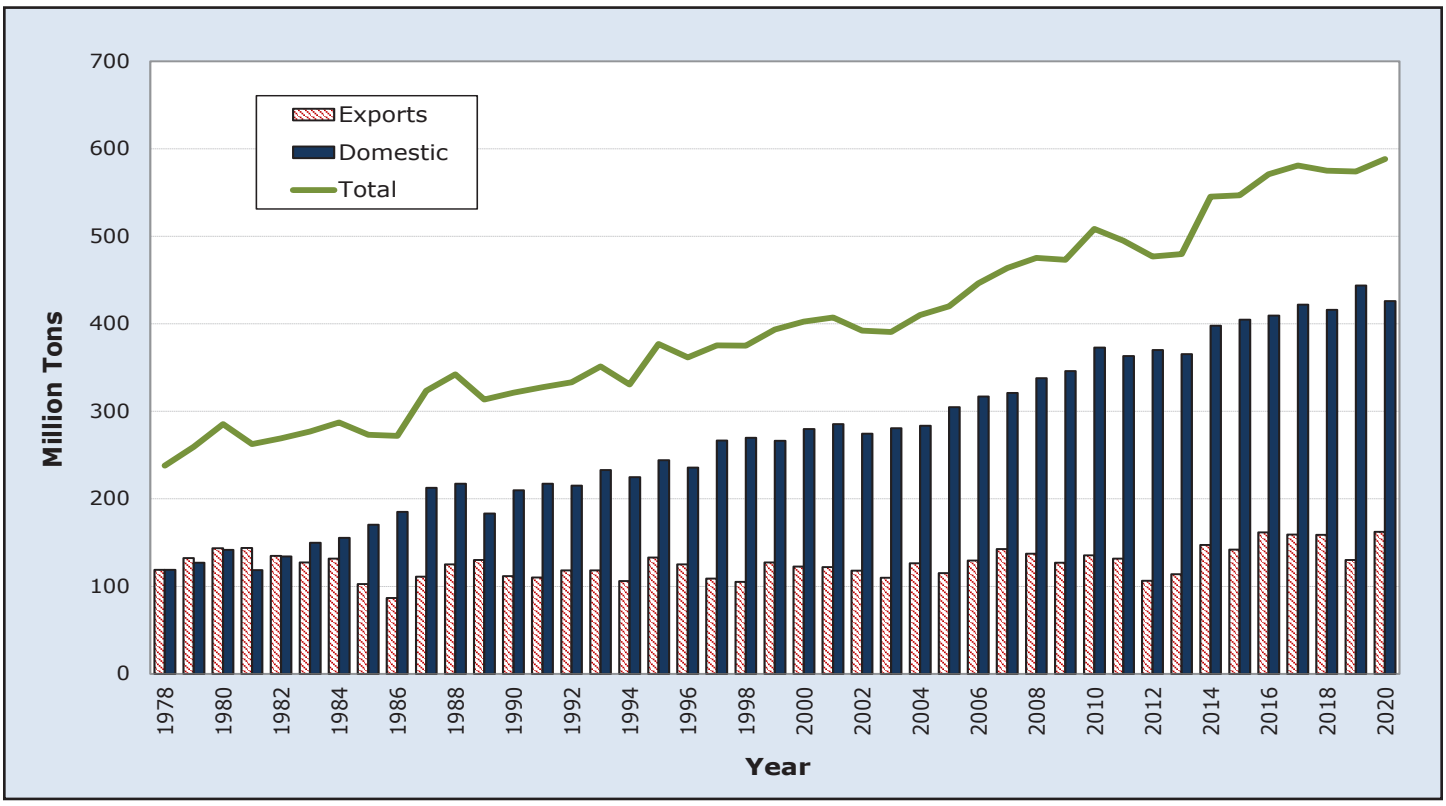


Figure 3: U.S. grain shipments by commodity, 1978-2020

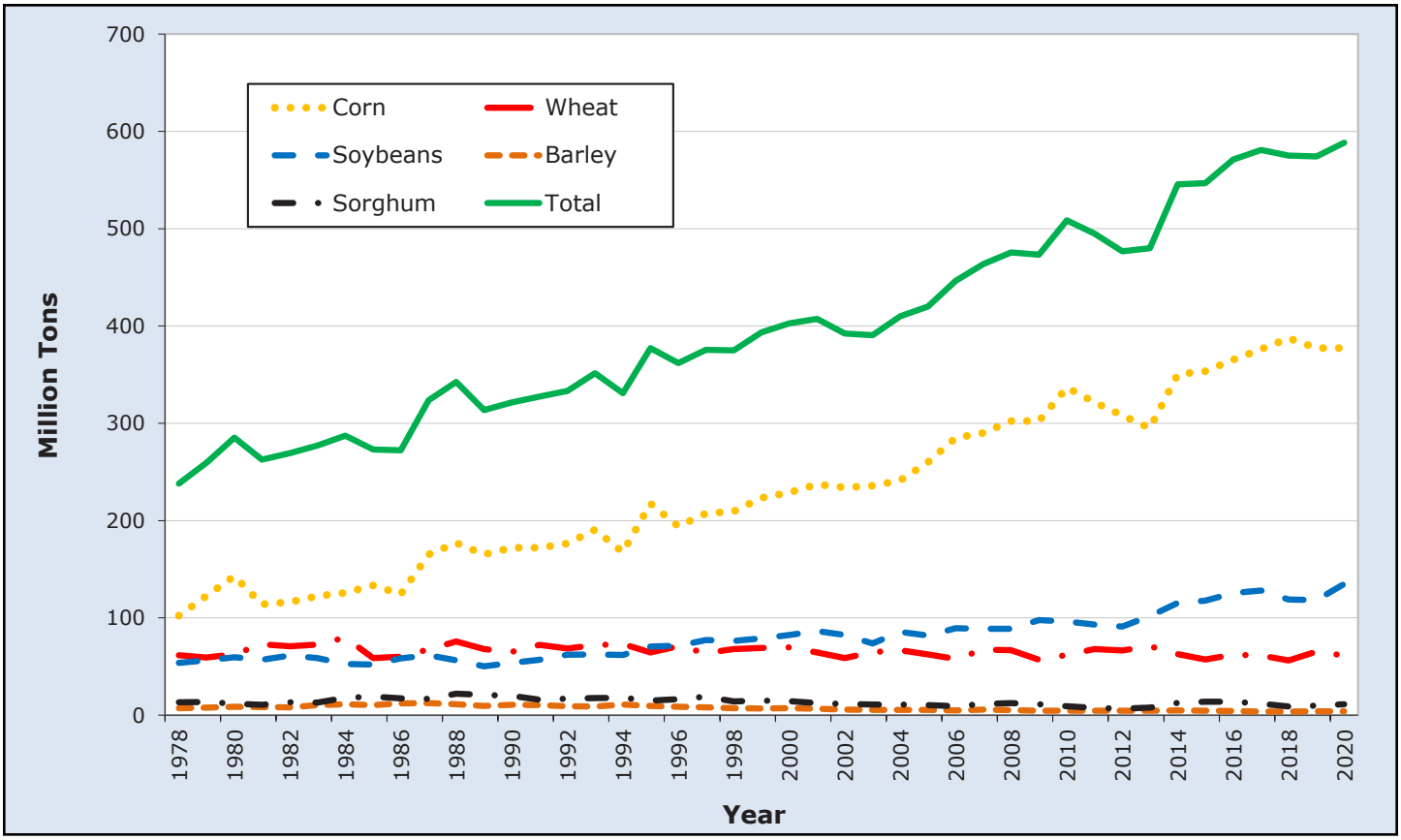


Table 1: Tonnages of U.S. grains transported, by type of crop and type of movement, 2004-2020

Year	Corn	Wheat	Soybeans	Sorghum	Barley	All grains
	1,000 tons					
Total						
2004	241,129	66,878	85,645	10,885	5,386	409,923
2005	260,160	62,372	81,925	10,293	5,334	420,085
2006	284,980	57,895	89,274	9,284	4,887	446,318
2007	290,163	67,470	88,782	11,602	5,689	463,705
2008	302,243	66,847	88,832	12,419	5,174	475,516
2009	302,403	56,895	97,860	11,319	4,685	473,163
2010	336,597	61,780	96,186	9,220	4,651	508,434
2011	321,787	68,045	93,110	7,592	4,456	494,991
2012	308,008	66,591	91,043	6,698	4,538	476,878
2013	295,101	70,691	101,639	7,799	4,648	479,878
2014	350,231	62,616	115,292	12,553	4,784	545,475
2015	353,472	57,186	117,619	13,847	4,649	546,774
2016	365,303	62,086	125,644	13,714	4,365	571,112
2017	375,957	61,132	128,246	11,873	3,799	581,007
2018	387,432	56,234	118,739	9,016	3,655	575,076
2019	377,092	65,273	118,128	9,788	3,894	574,176
2020	377,153	61,239	134,858	11,091	3,982	588,322
Export						
2004	53,394	34,728	32,915	5,089	370	126,496
2005	50,629	30,413	28,196	5,062	839	115,140
2006	63,429	26,815	33,495	5,205	439	129,384
2007	63,438	37,238	34,765	6,326	832	142,599
2008	58,874	33,812	38,379	5,813	601	137,478
2009	52,749	25,153	44,971	4,164	132	127,169
2010	54,819	31,174	45,149	4,143	189	135,474
2011	50,371	36,540	40,958	3,728	218	131,815
2012	35,265	29,256	39,826	1,991	213	106,551
2013	26,200	35,922	49,157	2,492	217	113,988
2014	55,305	28,677	55,273	7,870	369	147,494
2015	48,923	23,939	58,279	10,595	336	142,072
2016	61,918	27,176	64,997	7,566	109	161,766
2017	57,832	30,595	64,012	6,617	146	159,202
2018	76,674	25,256	52,603	4,319	106	158,958
2019	46,435	30,386	50,377	2,942	130	130,271
2020	57,606	29,557	67,817	7,242	209	162,431
Domestic						
2004	187,735	32,150	52,731	5,796	5,015	283,428
2005	209,532	31,959	53,729	5,231	4,495	304,945
2006	221,551	31,080	55,779	4,078	4,447	316,934
2007	226,725	30,232	54,017	5,276	4,856	321,107
2008	243,369	33,035	50,453	6,606	4,574	338,038
2009	249,654	31,743	52,889	7,155	4,553	345,994
2010	281,777	30,607	51,036	5,077	4,462	372,960
2011	271,416	31,505	52,153	3,864	4,238	363,176
2012	272,743	37,015	51,217	4,707	4,324	370,006
2013	268,901	34,260	52,482	5,307	4,431	365,381
2014	294,926	33,939	60,019	4,683	4,414	397,981
2015	304,550	33,247	59,340	3,252	4,313	404,701
2016	303,385	34,910	60,647	6,148	4,257	409,346
2017	318,125	30,537	64,234	5,257	3,652	421,805
2018	310,758	30,978	66,136	4,697	3,549	416,118
2019	330,657	34,887	67,751	6,846	3,765	443,905
2020	319,548	31,682	67,041	3,849	3,772	425,892

Figure 4: U.S. corn, soybeans, and wheat production, 1978-2020

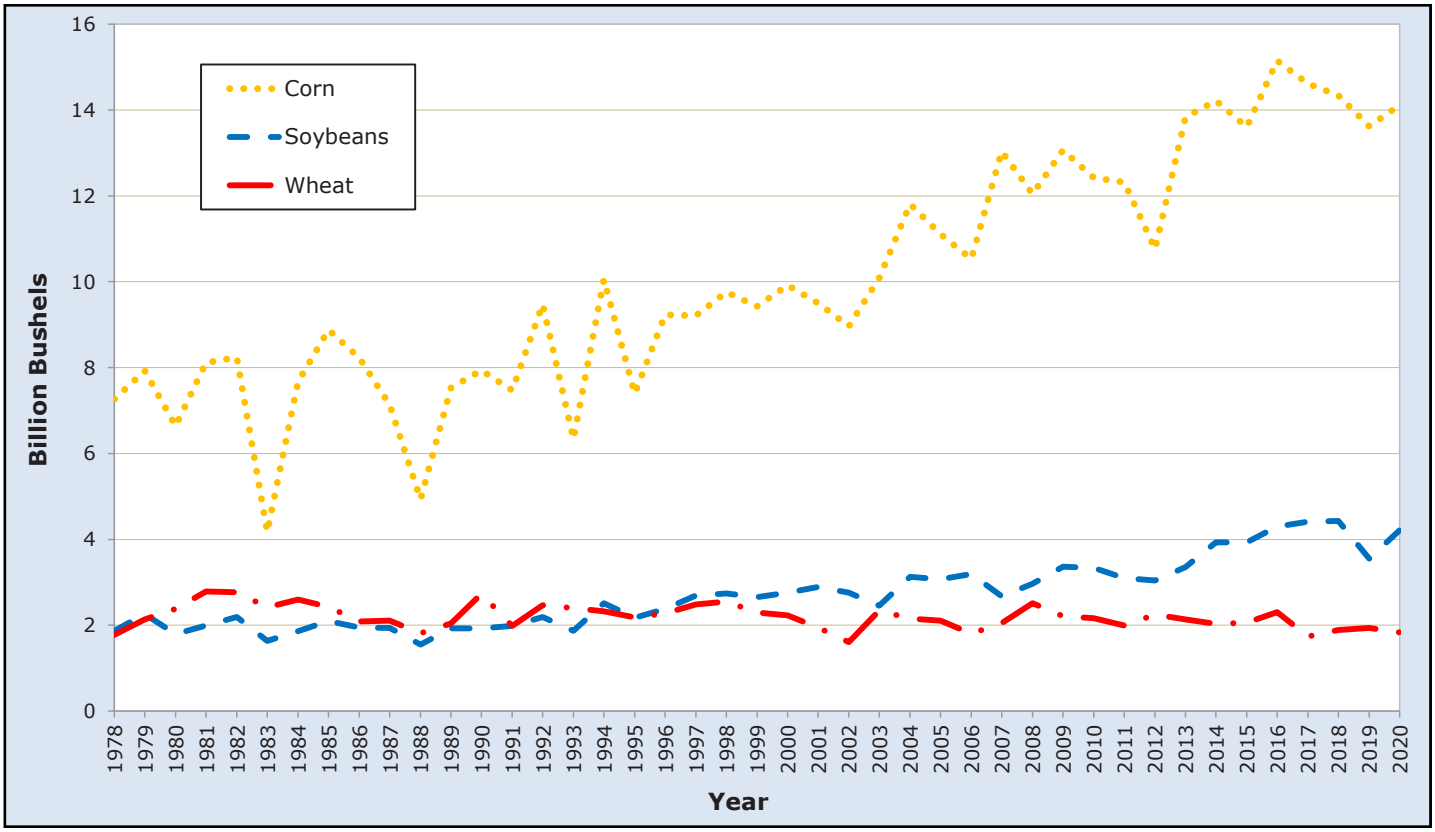


Figure 5: U.S. grain modal shares, 1978-2020

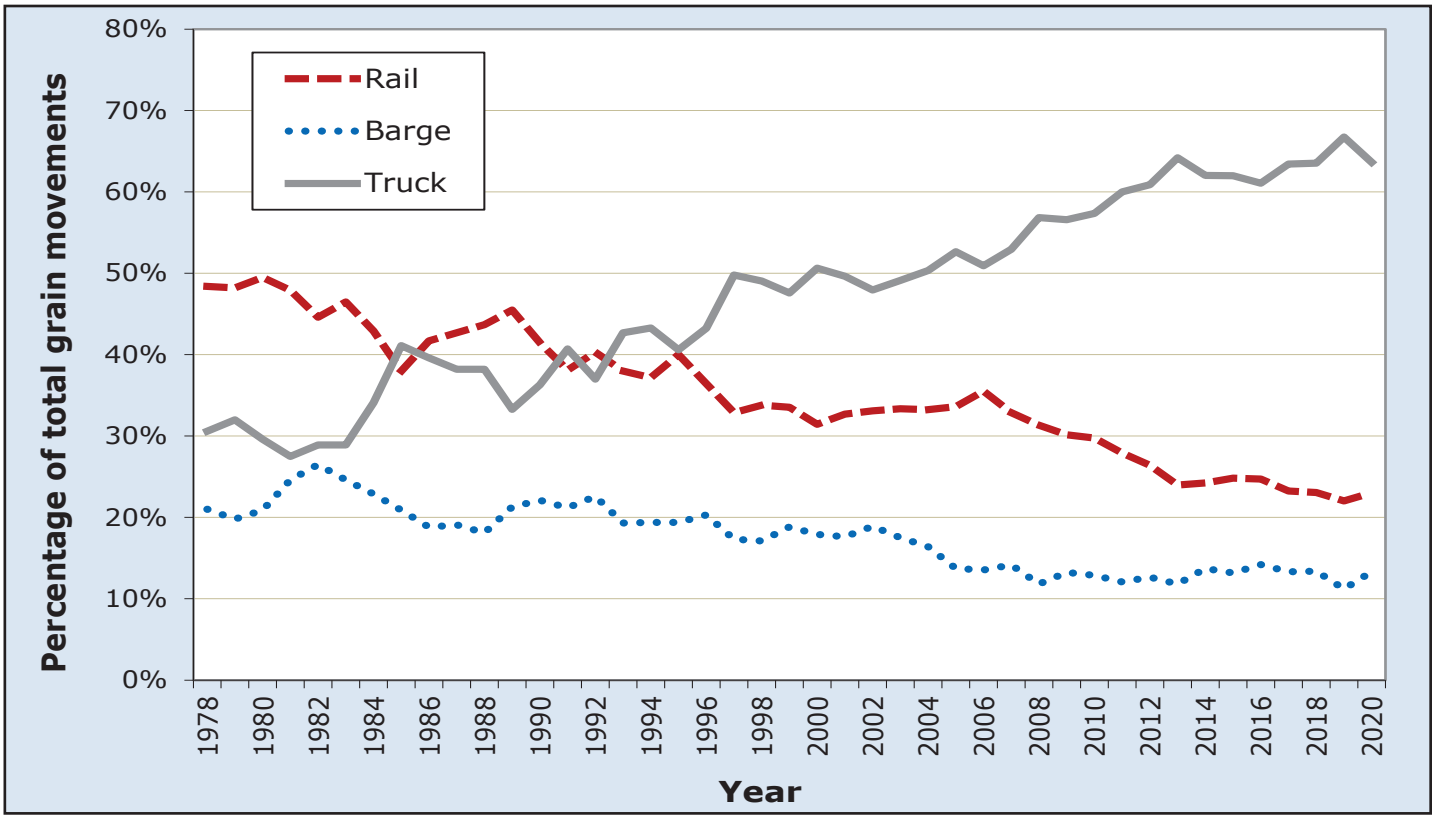


Table 2: Tonnages and modal shares for all U.S. grains, 2004–2020

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Total						
2004	136,354	33	67,274	16	206,296	50
2005	141,145	34	57,668	14	221,272	53
2006	158,549	36	60,484	14	227,285	51
2007	152,427	33	65,750	14	245,529	53
2008	149,061	31	56,118	12	270,337	57
2009	142,682	30	62,689	13	267,793	57
2010	151,274	30	65,428	13	291,732	57
2011	138,159	28	59,789	12	297,042	60
2012	125,993	26	60,426	13	290,459	61
2013	115,107	24	56,764	12	308,007	64
2014	132,234	24	74,966	14	338,275	62
2015	135,734	25	72,063	13	338,976	62
2016	141,140	25	81,235	14	348,737	61
2017	135,128	23	77,412	13	368,468	63
2018	132,604	23	77,156	13	365,317	64
2019	126,505	22	64,405	11	383,265	67
2020	135,502	23	78,361	13	374,460	64
Export						
2004	49,760	39	61,729	49	15,006	12
2005	53,797	47	52,981	46	8,361	7
2006	59,719	46	56,617	44	13,048	10
2007	63,138	44	61,613	43	17,848	13
2008	68,176	50	51,765	38	17,537	13
2009	59,143	47	59,095	46	8,932	7
2010	68,222	50	61,371	45	5,880	4
2011	54,447	41	55,877	42	21,491	16
2012	41,471	39	55,603	52	9,798	9
2013	39,984	35	51,854	45	22,660	20
2014	53,491	36	71,045	48	22,958	16
2015	50,530	36	68,157	48	23,386	16
2016	63,725	39	77,253	48	20,788	13
2017	59,613	37	73,426	46	26,164	16
2018	57,832	36	73,718	46	27,409	17
2019	50,578	39	61,814	47	17,879	14
2020	60,994	38	75,141	46	26,296	16
Domestic						
2004	86,594	31	5,544	2	191,290	67
2005	87,347	29	4,686	2	212,911	70
2006	98,830	31	3,867	1	214,237	68
2007	89,289	28	4,137	1	227,681	71
2008	80,885	24	4,353	1	252,799	75
2009	83,539	24	3,594	1	258,861	75
2010	83,051	22	4,057	1	285,852	77
2011	83,712	23	3,912	1	275,551	76
2012	84,523	23	4,823	1	280,660	76
2013	75,123	21	4,910	1	285,347	78
2014	78,743	20	3,921	1	315,317	79
2015	85,204	21	3,907	1	315,591	78
2016	77,415	19	3,982	1	327,949	80
2017	75,515	18	3,986	1	342,304	81
2018	74,772	18	3,438	1	337,908	81
2019	75,927	17	2,592	1	365,386	82
2020	74,508	17	3,220	1	348,164	82

Table 3: Modal Share Summary: 2020 and 5-year average, percent

Mode/ Year	Corn			Wheat			Soybeans			All grains		
	Exports	Domestic	All Corn	Exports	Domestic	All Wheat	Exports	Domestic	All Soybeans	Exports	Domestic	All Grains
Rail 2020	34	15	18	53	47	50	31	14	23	38	17	23
Rail 5-yr avg	35	15	19	59	50	54	27	13	20	38	18	23
Barge 2020	53	0	8	28	1	14	53	2	28	46	1	13
Barge 5-yr avg	51	0	9	30	1	15	55	3	28	47	1	13
Truck 2020	13	84	73	19	52	36	16	83	50	16	82	64
Truck 5-yr avg	14	84	73	11	49	31	18	84	52	15	81	64

Corn Modal Shares

Table 4: Tonnages and modal shares for U.S. corn, 2004–2020

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Total						
2004	74,766	31	37,302	15	129,062	54
2005	75,261	29	31,739	12	153,161	59
2006	87,514	31	34,587	12	162,878	57
2007	78,650	27	37,407	13	174,106	60
2008	75,652	25	30,088	10	196,503	65
2009	69,803	23	32,147	11	200,453	66
2010	74,909	22	33,134	10	228,553	68
2011	72,059	22	29,434	9	220,294	68
2012	64,514	21	22,331	7	221,162	72
2013	53,808	18	18,421	6	222,872	76
2014	66,701	19	35,072	10	248,457	71
2015	69,153	20	30,572	9	253,747	72
2016	69,839	19	35,729	10	259,735	71
2017	67,278	18	32,815	9	275,864	73
2018	78,696	20	37,555	10	271,181	70
2019	64,720	17	23,130	6	289,243	77
2020	68,022	18	31,997	8	277,134	73
Export						
2004	16,055	30	33,974	64	3,365	6
2005	18,380	36	28,778	57	3,472	7
2006	24,744	39	31,941	50	6,744	11
2007	20,478	32	34,689	55	8,270	13
2008	24,615	42	27,457	47	6,802	12
2009	19,801	38	30,013	57	2,936	6
2010	22,070	40	31,174	57	1,575	3
2011	17,237	34	27,331	54	5,802	12
2012	10,108	29	19,825	56	5,332	15
2013	7,034	27	16,019	61	3,147	12
2014	14,822	27	33,624	61	6,859	12
2015	14,116	29	29,256	60	5,550	11
2016	21,582	35	34,187	55	6,150	10
2017	18,523	32	31,213	54	8,096	14
2018	30,369	40	36,356	47	9,949	13
2019	15,539	33	22,068	48	8,829	19
2020	19,593	34	30,716	53	7,296	13
Domestic						
2004	58,711	31	3,328	2	125,697	67
2005	56,881	27	2,961	1	149,689	71
2006	62,770	28	2,646	1	156,134	70
2007	58,171	26	2,718	1	165,836	73
2008	51,037	21	2,631	1	189,701	78
2009	50,002	20	2,135	1	197,517	79
2010	52,839	19	1,960	1	226,978	81
2011	54,822	20	2,102	1	214,492	79
2012	54,406	20	2,506	1	215,830	79
2013	46,774	17	2,402	1	219,725	82
2014	51,879	18	1,448	0	241,598	82
2015	55,037	18	1,317	0	248,196	81
2016	48,258	16	1,542	1	253,585	84
2017	48,755	15	1,602	1	267,768	84
2018	48,327	16	1,199	0	261,232	84
2019	49,181	15	1,062	0	280,414	85
2020	48,429	15	1,281	0	269,838	84

Figure 6: U.S. corn domestic shipments by mode, 2004–2020

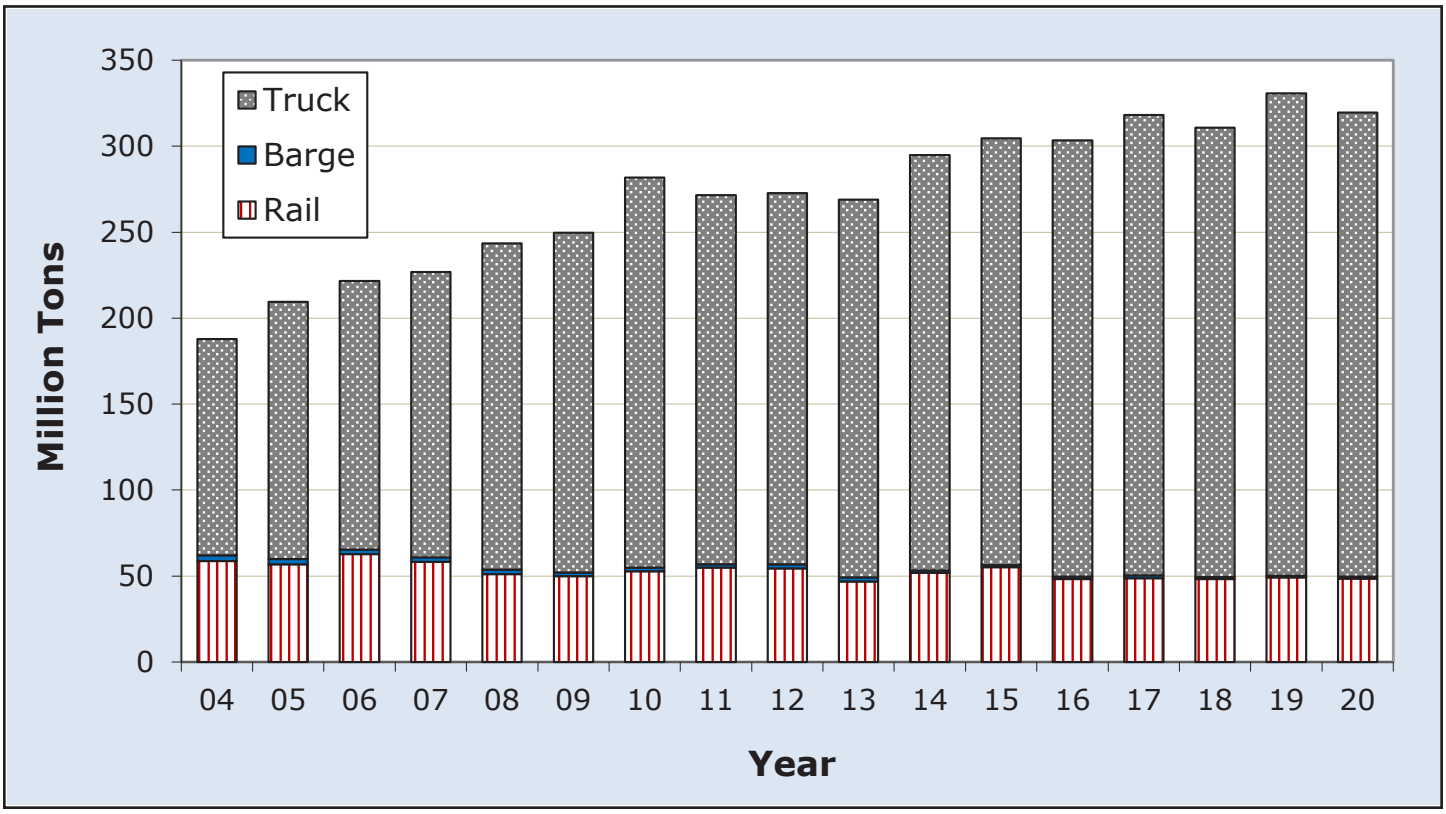
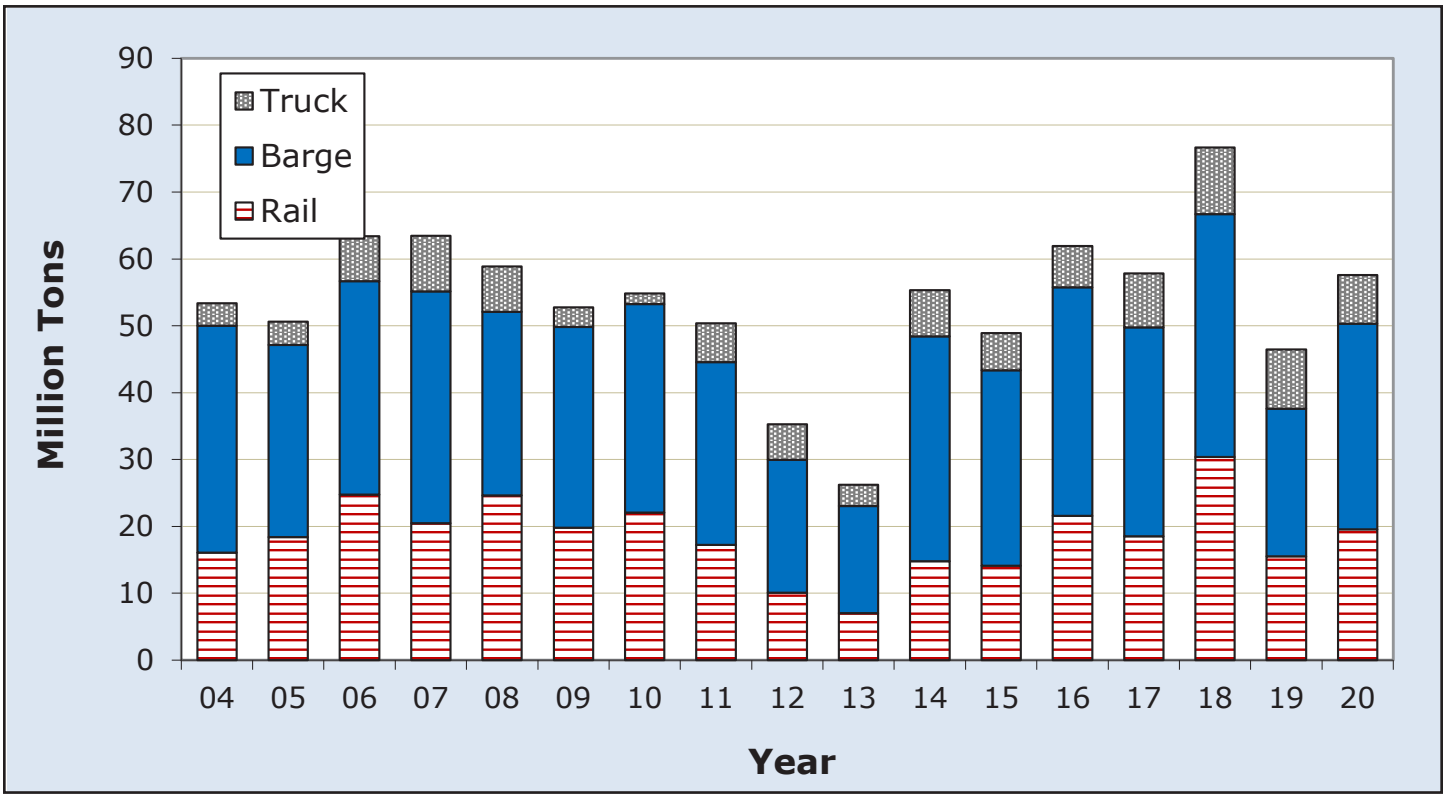


Figure 7: U.S. corn export shipments by mode, 2004–2020



Wheat Modal Shares

Table 5: Tonnages and modal shares for U.S. wheat, 2004-2020

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Total						
2004	40,934	61	11,937	18	14,008	21
2005	44,195	71	8,668	14	9,509	15
2006	44,740	77	8,767	15	4,388	8
2007	47,781	71	10,515	16	9,174	14
2008	45,670	68	8,872	13	12,305	18
2009	41,094	72	8,462	15	7,339	13
2010	44,017	71	8,471	14	9,293	15
2011	43,417	64	9,844	14	14,784	22
2012	35,025	53	10,814	16	20,753	31
2013	36,290	51	15,170	21	19,232	27
2014	33,527	54	10,055	16	19,033	30
2015	32,388	57	9,112	16	15,685	27
2016	34,522	56	8,445	14	19,119	31
2017	35,917	59	9,279	15	15,935	26
2018	29,758	53	9,020	16	17,457	31
2019	35,565	54	8,876	14	20,832	32
2020	30,459	50	8,733	14	22,047	36
Export						
2004	23,157	67	11,370	33	200	1
2005	22,120	73	8,294	27	0	0
2006	18,249	68	8,566	32	0	0
2007	26,520	71	10,229	27	489	1
2008	25,384	75	8,428	25	0	0
2009	17,183	68	7,970	32	0	0
2010	23,161	74	8,013	26	0	0
2011	24,175	66	9,333	26	3,033	8
2012	16,474	56	10,126	35	2,655	9
2013	18,034	50	14,519	40	3,368	9
2014	16,700	58	9,437	33	2,539	9
2015	13,855	58	8,411	35	1,673	7
2016	17,438	64	7,887	29	1,851	7
2017	19,398	63	8,824	29	2,373	8
2018	13,818	55	8,628	34	2,810	11
2019	18,913	62	8,584	28	2,889	10
2020	15,652	53	8,353	28	5,552	19
Domestic						
2004	17,777	55	566	2	13,807	43
2005	22,075	69	375	1	9,509	30
2006	26,491	85	200	1	4,388	14
2007	21,261	70	286	1	8,685	29
2008	20,286	61	444	1	12,305	37
2009	23,911	75	493	2	7,339	23
2010	20,856	68	458	1	9,293	30
2011	19,242	61	511	2	11,752	37
2012	18,551	50	688	2	17,776	48
2013	18,255	53	651	2	15,354	45
2014	16,827	50	617	2	16,494	49
2015	18,533	56	701	2	14,012	42
2016	17,084	49	558	2	17,267	49
2017	16,519	54	456	1	13,562	44
2018	15,939	51	392	1	14,646	47
2019	16,651	48	292	1	17,944	51
2020	14,807	47	380	1	16,495	52

Figure 8: U.S. wheat domestic shipments by mode, 2004–2020

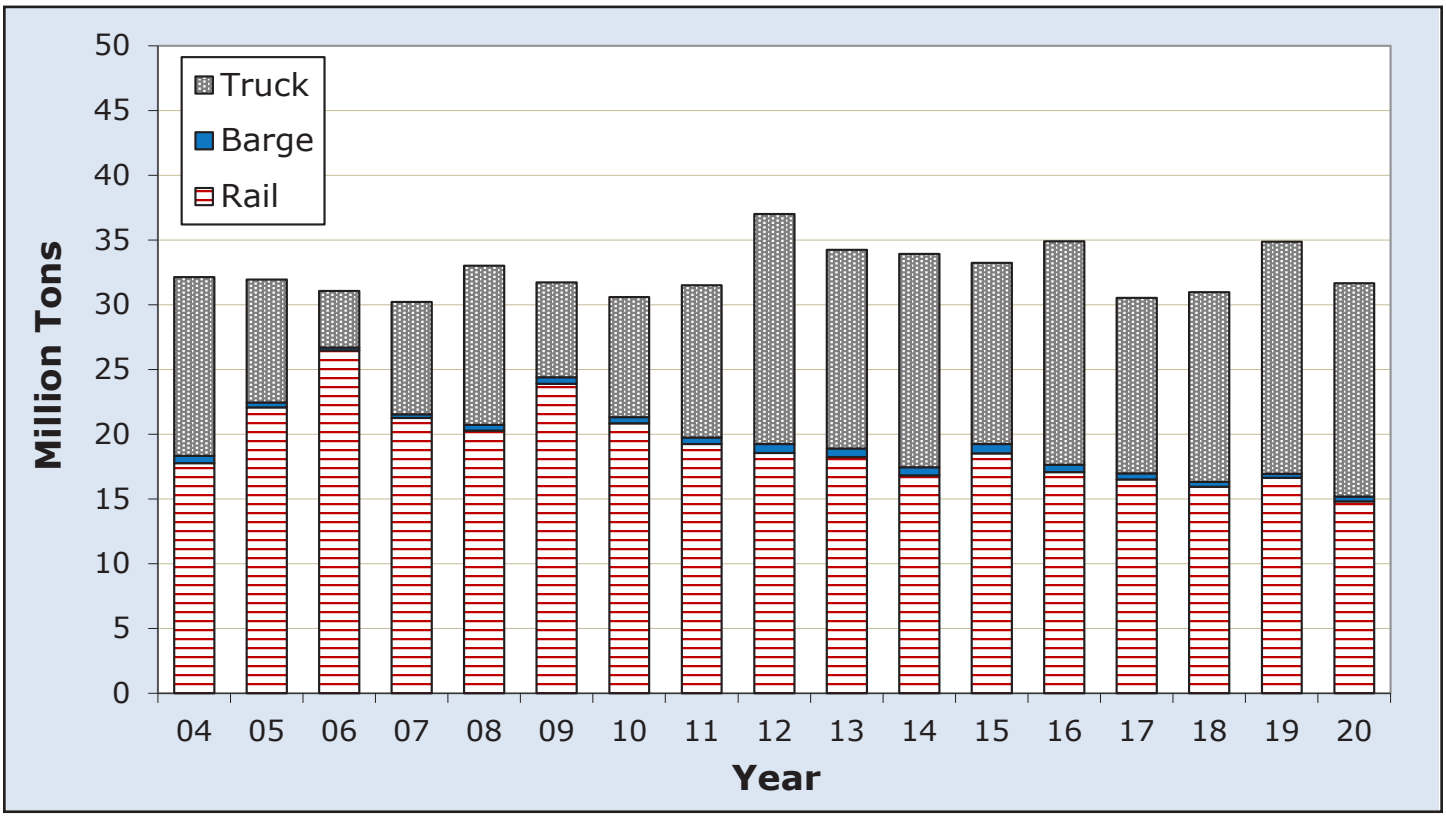
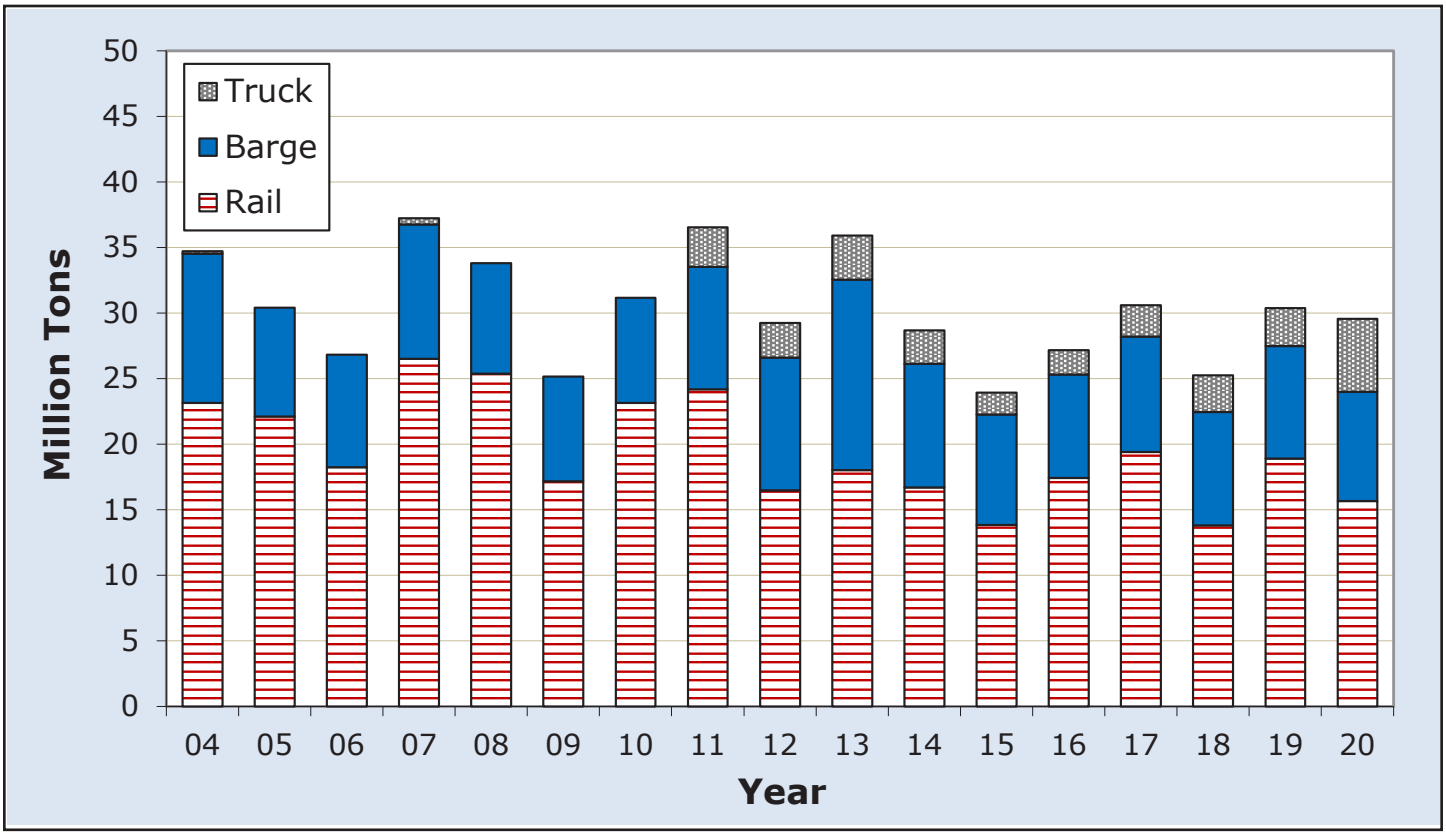


Figure 9: U.S. wheat export shipments by mode, 2004-2020



Soybean Modal Shares

Table 6: Tonnages and modal shares for U.S. soybeans, 2004-2020

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Total						
2004	15,056	18	17,053	20	53,537	63
2005	16,141	20	16,332	20	49,452	60
2006	19,896	22	16,221	18	53,156	60
2007	19,478	22	16,327	18	52,976	60
2008	20,899	24	16,326	18	51,607	58
2009	25,764	26	21,569	22	50,527	52
2010	26,800	28	23,472	24	45,913	48
2011	19,055	20	19,962	21	54,093	58
2012	23,281	26	26,604	29	41,158	45
2013	21,591	21	22,399	22	57,648	57
2014	24,472	21	28,590	25	62,230	54
2015	25,239	21	30,131	26	62,250	53
2016	29,315	23	36,825	29	59,505	47
2017	25,305	20	35,235	27	67,706	53
2018	18,653	16	30,538	26	69,549	59
2019	23,083	20	32,384	27	62,660	53
2020	30,345	23	37,585	28	66,928	50
Export						
2004	8,522	26	15,412	47	8,981	27
2005	10,676	38	15,030	53	2,490	9
2006	13,541	40	15,240	45	4,714	14
2007	12,524	36	15,242	44	6,999	20
2008	14,492	38	15,089	39	8,798	23
2009	19,694	44	20,634	46	4,644	10
2010	20,506	45	21,864	48	2,779	6
2011	12,041	29	18,793	46	10,124	25
2012	14,598	37	25,124	63	104	0
2013	14,426	29	20,611	42	14,119	29
2014	17,231	31	26,791	48	11,251	20
2015	16,168	28	28,296	49	13,814	24
2016	19,693	30	34,968	54	10,336	16
2017	17,255	27	33,308	52	13,449	21
2018	10,402	20	28,695	55	13,507	26
2019	14,819	29	31,149	62	4,409	9
2020	20,810	31	36,026	53	10,981	16
Domestic						
2004	6,533	12	1,641	3	44,556	84
2005	5,465	10	1,302	2	46,962	87
2006	6,355	11	982	2	48,442	87
2007	6,953	13	1,086	2	45,978	85
2008	6,407	13	1,237	2	42,809	85
2009	6,070	11	936	2	45,883	87
2010	6,294	12	1,608	3	43,134	85
2011	7,015	13	1,169	2	43,969	84
2012	8,683	17	1,480	3	41,054	80
2013	7,165	14	1,788	3	43,529	83
2014	7,241	12	1,799	3	50,979	85
2015	9,070	15	1,834	3	48,436	82
2016	9,622	16	1,857	3	49,169	81
2017	8,050	13	1,927	3	54,257	84
2018	8,251	12	1,843	3	56,042	85
2019	8,264	12	1,235	2	58,251	86
2020	9,535	14	1,559	2	55,947	83

Figure 10: U.S. soybean domestic shipments by mode, 2004-2020

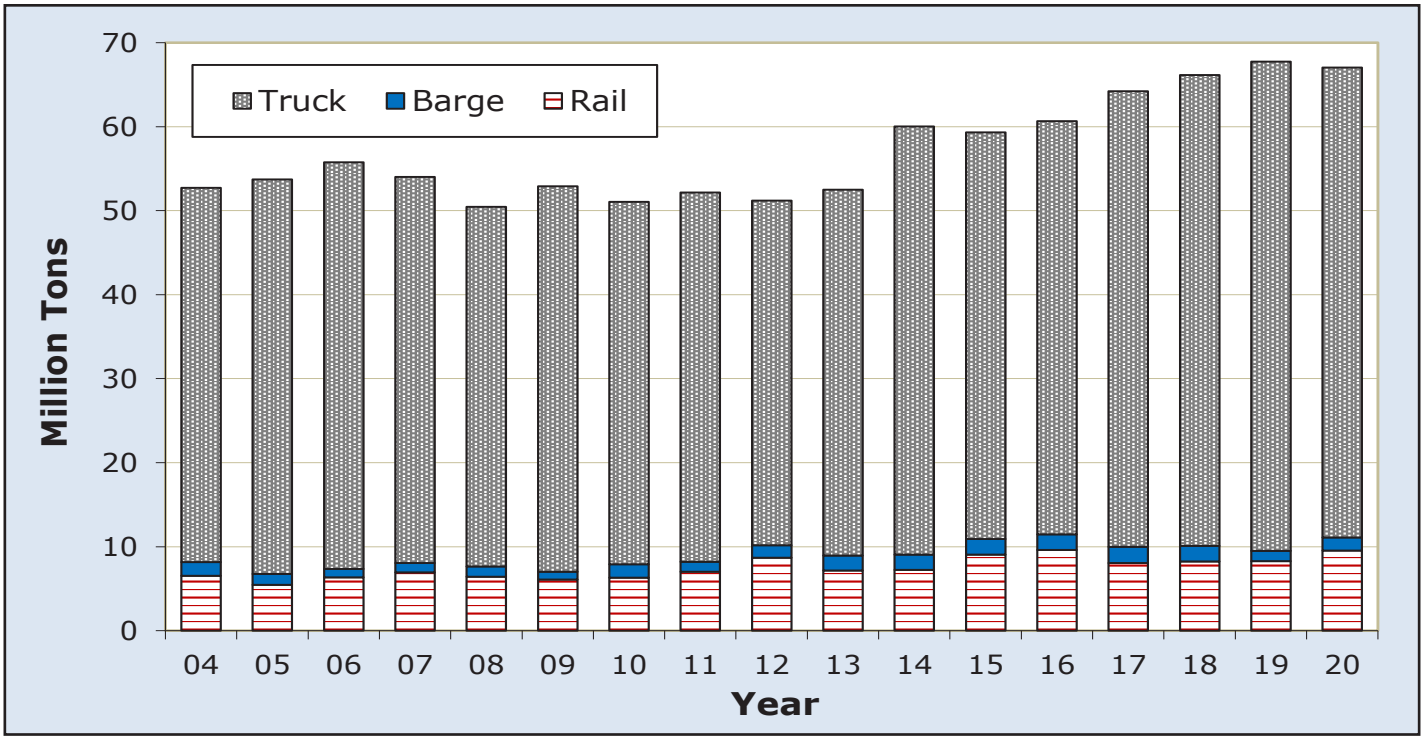
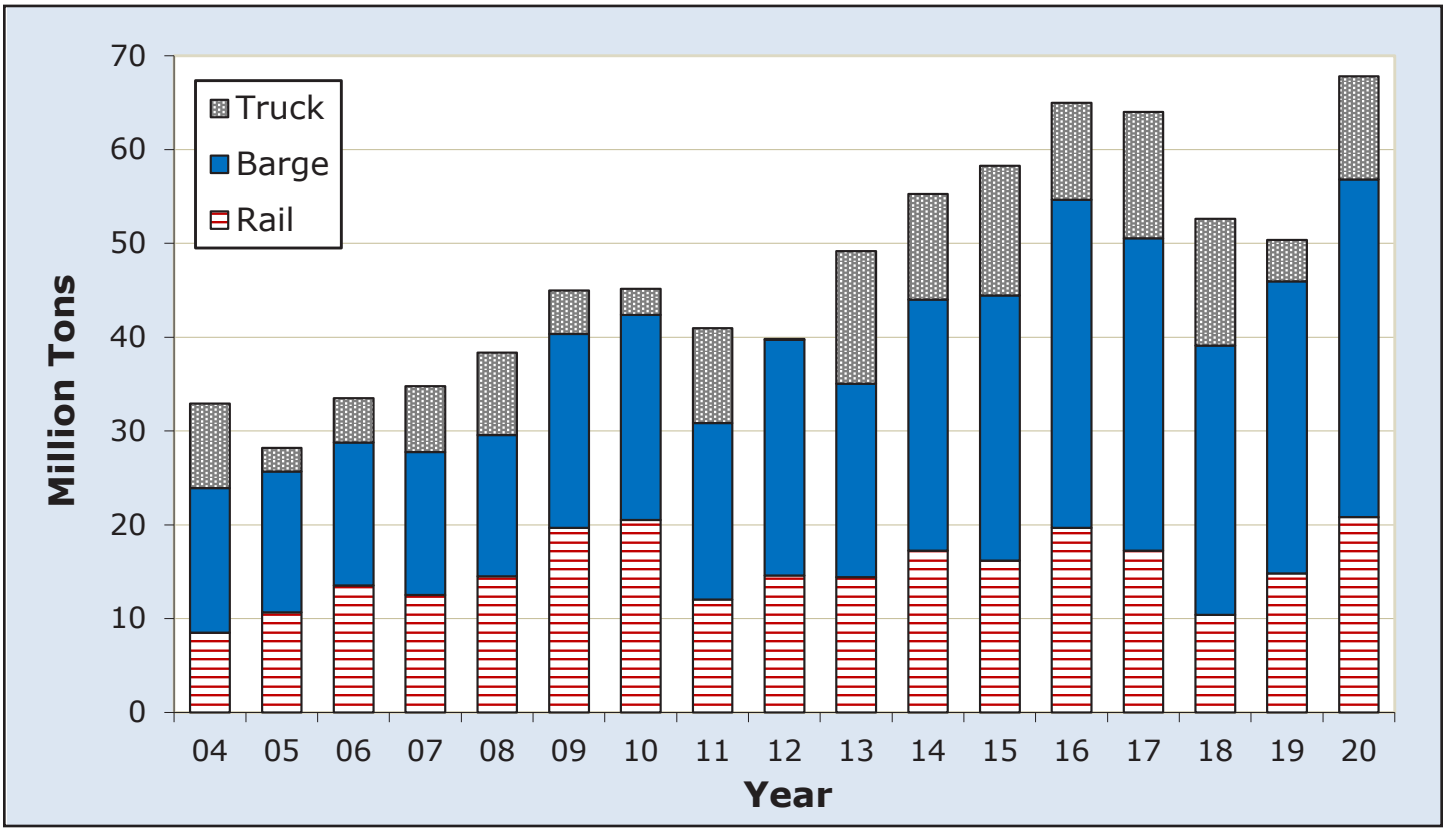


Figure 11: U.S. soybean export shipments by mode, 2004-2020



Sorghum Modal Shares

Table 7: Tonnages and modal shares for U.S. sorghum, 2004-2020

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Total						
2004	2,334	21	852	8	7,698	71
2005	2,366	23	721	7	7,206	70
2006	3,426	37	730	8	5,127	55
2007	3,490	30	1,252	11	6,859	59
2008	3,779	30	634	5	8,006	64
2009	3,218	28	442	4	7,660	68
2010	2,886	31	315	3	6,019	65
2011	1,078	14	427	6	6,087	80
2012	653	10	577	9	5,468	82
2013	667	9	691	9	6,441	83
2014	4,873	39	1,046	8	6,633	53
2015	6,361	46	2,139	15	5,347	39
2016	5,127	37	225	2	8,362	61
2017	4,518	38	74	1	7,281	61
2018	3,257	36	43	0	5,716	63
2019	1,567	16	15	0	8,206	84
2020	4,851	44	44	0	6,196	56
Export						
2004	1,776	35	852	17	2,460	48
2005	1,941	38	721	14	2,399	47
2006	2,886	55	730	14	1,590	31
2007	2,989	47	1,246	20	2,091	33
2008	3,253	56	622	11	1,938	33
2009	2,372	57	440	11	1,352	32
2010	2,307	56	309	7	1,526	37
2011	776	21	420	11	2,532	68
2012	120	6	485	24	1,386	70
2013	316	13	660	26	1,515	61
2014	4,528	58	1,033	13	2,309	29
2015	6,117	58	2,130	20	2,349	22
2016	4,903	65	212	3	2,451	32
2017	4,297	65	74	1	2,245	34
2018	3,137	73	40	1	1,143	26
2019	1,177	40	13	0	1,753	60
2020	4,732	65	44	1	2,466	34
Domestic						
2004	558	10	0	0	5,238	90
2005	425	8	0	0	4,806	92
2006	540	13	0	0	3,538	87
2007	502	10	6	0	4,769	90
2008	527	8	11	0	6,068	92
2009	846	12	2	0	6,307	88
2010	579	11	5	0	4,493	88
2011	302	8	7	0	3,555	92
2012	534	11	92	2	4,082	87
2013	351	7	31	1	4,925	93
2014	345	7	13	0	4,324	92
2015	244	8	9	0	2,999	92
2016	224	4	13	0	5,911	96
2017	221	4	0	0	5,035	96
2018	120	3	4	0	4,574	97
2019	390	6	2	0	6,454	94
2020	119	3	0	0	3,730	97

Figure 12: U.S. sorghum domestic shipments by mode, 2004–2020

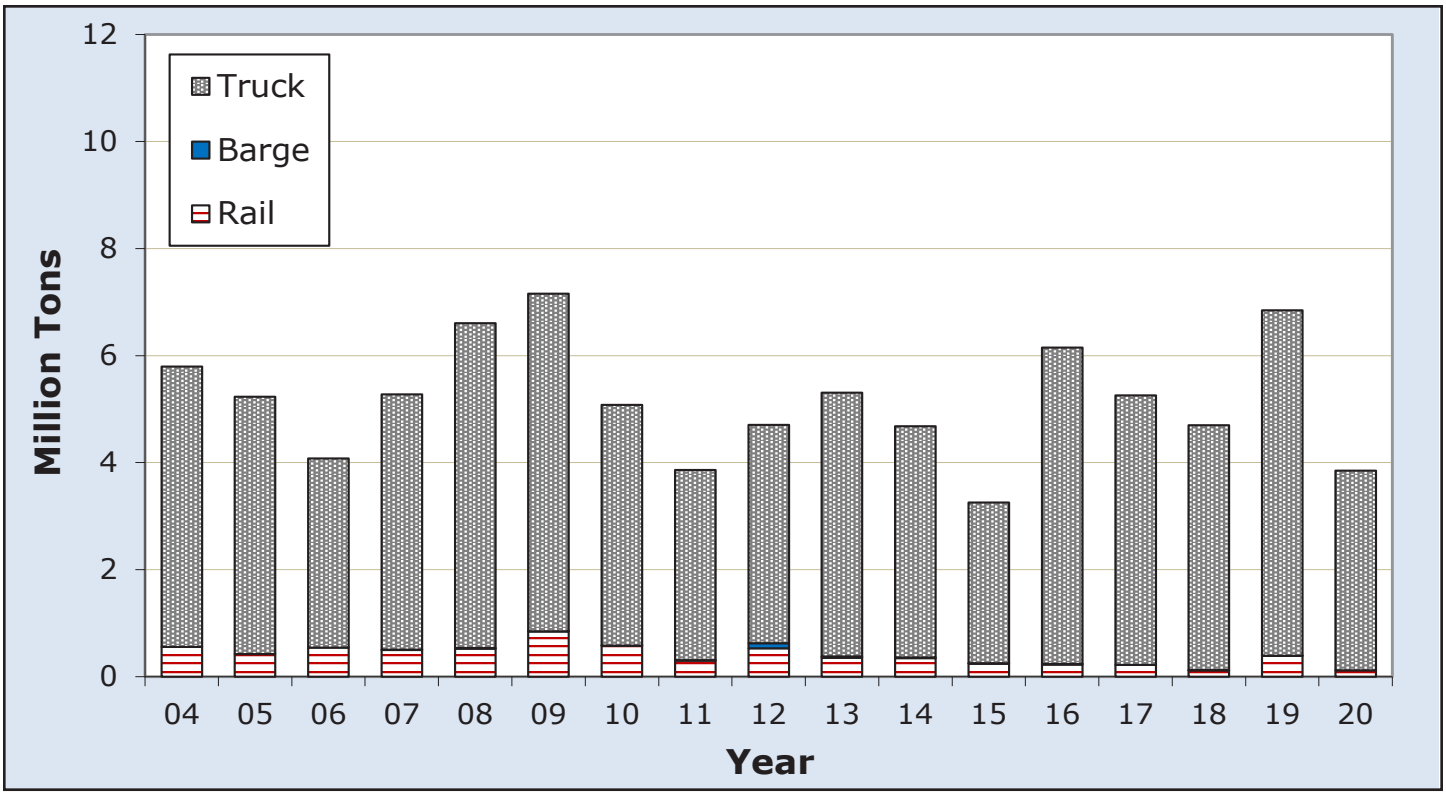
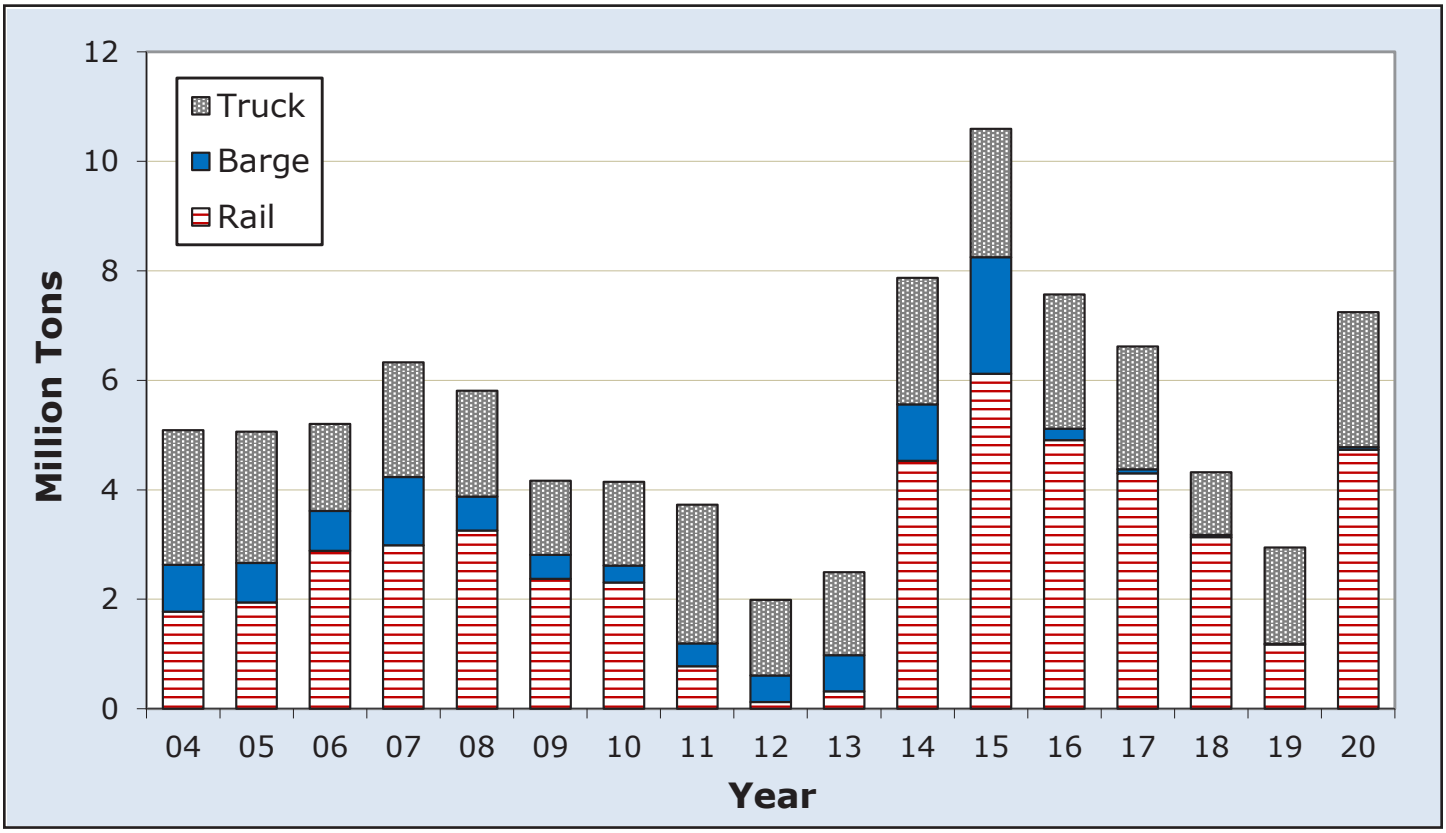


Figure 13: U.S. sorghum export shipments by mode, 2004–2020



Barley Modal Shares

Table 8: Tonnages and modal shares for U.S. barley, 2004-2020

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Total						
2004	3,264	61	130	2	1,991	37
2005	3,182	60	207	4	1,944	36
2006	2,972	61	179	4	1,735	35
2007	3,028	53	247	4	2,413	42
2008	3,061	59	198	4	1,916	37
2009	2,803	60	68	1	1,814	39
2010	2,661	57	36	1	1,954	42
2011	2,550	57	123	3	1,784	40
2012	2,520	56	100	2	1,918	42
2013	2,751	59	83	2	1,814	39
2014	2,660	56	203	4	1,921	40
2015	2,593	56	109	2	1,947	42
2016	2,337	54	12	0	2,016	46
2017	2,109	56	9	0	1,681	44
2018	2,240	61	0	0	1,414	39
2019	1,570	40	0	0	2,324	60
2020	1,826	46	2	0	2,154	54
Export						
2004	249	67	121	33	0	0
2005	680	81	159	19	0	0
2006	299	68	140	32	0	0
2007	626	75	206	25	0	0
2008	432	72	168	28	0	0
2009	93	70	39	30	0	0
2010	178	94	11	6	0	0
2011	218	100	0	0	0	0
2012	171	80	42	20	0	0
2013	173	80	44	20	0	0
2014	210	57	160	43	0	0
2015	272	81	64	19	0	0
2016	109	100	0	0	0	0
2017	140	95	7	5	0	0
2018	106	100	0	0	0	0
2019	130	100	0	0	0	0
2020	208	99	2	1	0	0
Domestic						
2004	3,015	60	9	0	1,991	40
2005	2,502	56	48	1	1,944	43
2006	2,673	60	39	1	1,735	39
2007	2,402	49	41	1	2,413	50
2008	2,629	57	29	1	1,916	42
2009	2,711	60	29	1	1,814	40
2010	2,483	56	26	1	1,954	44
2011	2,332	55	123	3	1,784	42
2012	2,349	54	58	1	1,918	44
2013	2,578	58	39	1	1,814	41
2014	2,450	56	43	1	1,921	44
2015	2,320	54	45	1	1,947	45
2016	2,229	52	12	0	2,016	47
2017	1,969	54	2	0	1,681	46
2018	2,134	60	0	0	1,414	40
2019	1,441	38	0	0	2,324	62
2020	1,618	43	0	0	2,154	57

Figure 14: U.S. barley domestic shipments by mode, 2004–2020

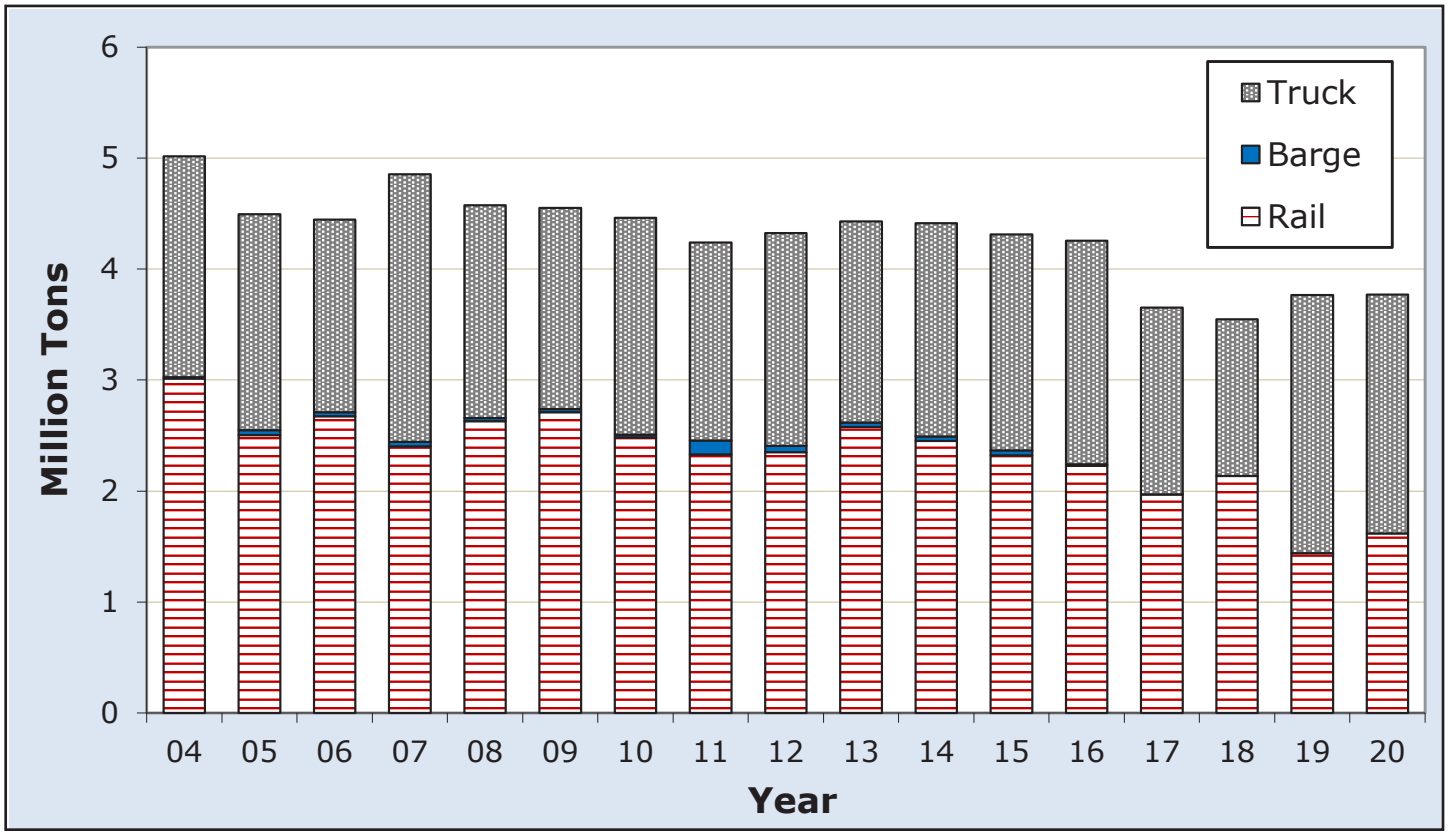
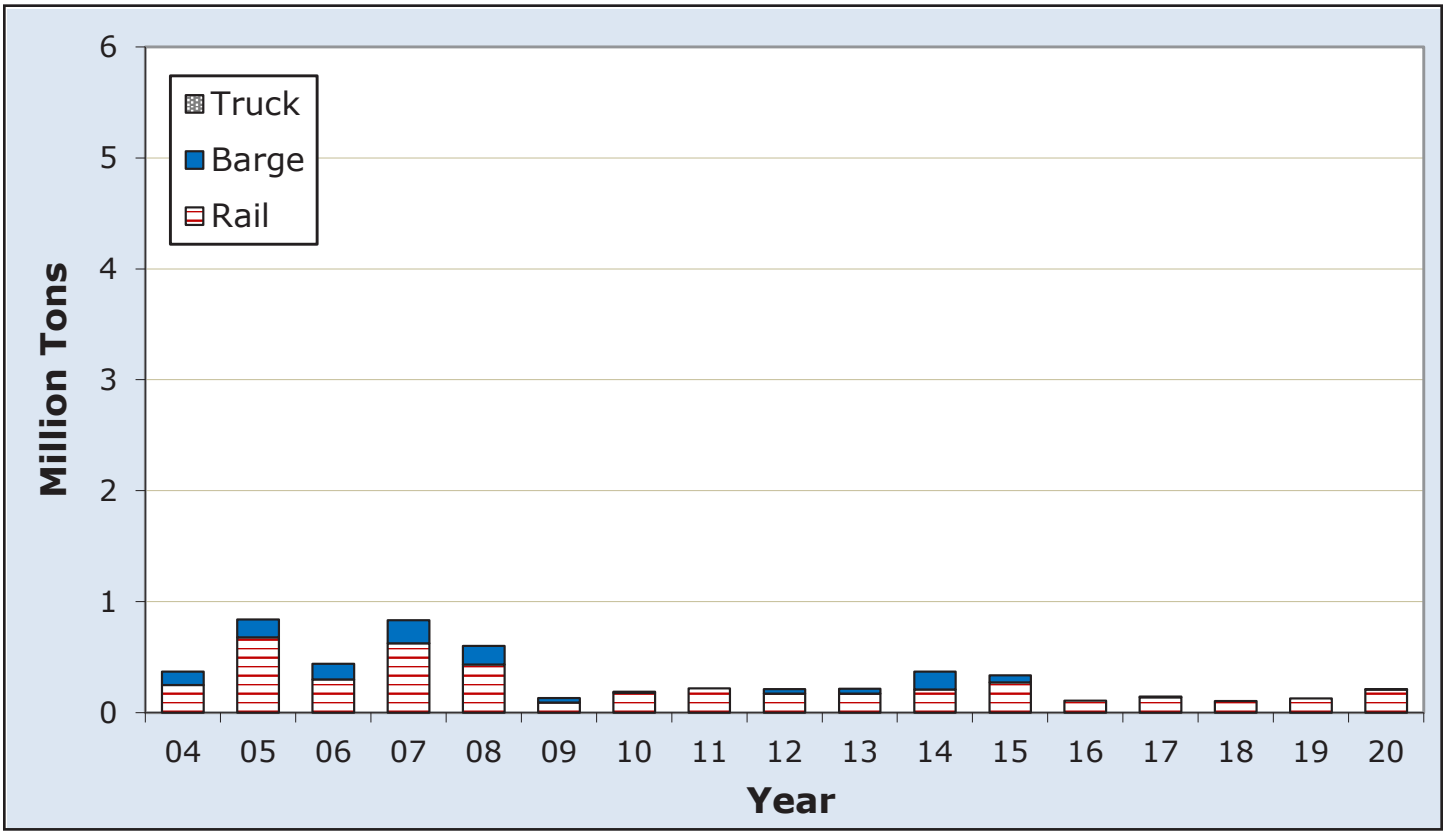


Figure 15: U.S. barley export shipments by mode, 2004–2020



Appendix A: Modal Share Methodology

Modal shares are calculated for all grains and each grain type, based on the estimated modal tonnages. These modal shares are determined for total, export, and domestic movements.

Total Tonnages. The approach used to estimate modal tonnages and shares requires that total tonnages of grain transported to market be determined. It is also necessary to determine the portions of total tonnages transported to domestic and export markets. Total tonnages are defined as total disappearance minus grain that was grown and used on-farm. Total disappearance for this study is calculated using the ERS Wheat Outlook, Feed Outlook, and Oil Crop Outlook reports. These reports include marketing year supply and disappearance tables that list domestic use and exports. The Oil Crop Outlook lists these numbers by marketing year. The other two reports break the numbers down on a quarterly basis. To get disappearance numbers by calendar year, monthly totals are calculated from the marketing year data and added together into respective calendar year totals.

Total Export. Total exports are calculated using export numbers reported in the ERS *Outlook* reports.

Total Domestic. Total domestic tonnages are estimated by subtracting total export tonnages from total disappearance.

Grown and Used-on-Farm Totals. Grown and used-on-farm data are provided by ERS. These data are reported in percentages by year and commodity. Production numbers for each commodity are multiplied by the grown and used-on-farm percentages. Those numbers are then subtracted from total disappearance to get total transported grain tonnages. Grain grown and used on-farm must be deducted from total disappearance because it generates no commercial transportation demand.

Rail Total. Annual rail movements come from the STB Master Carload Waybill Sample. STB's Waybill Sample is a stratified sample of carload waybills for terminated shipments by railroad carriers. The STB collects operating statistics on U.S. railroads, which can be used to estimate rail traffic volumes and railroad characteristics. Total tonnages are calculated using the billed weight in tons from the Waybill Sample and multiplying it by an expansion factor to estimate the tonnages for all grain movements by all railroads. Movements that originated and terminated in the same five-digit, Federal Information Processing Standards (FIPS) region are assumed to be short hauls, which would be double-counted and, thus, were deleted. Some grain is moved by a combination of rail and barge. Since this represents a relatively small amount of grain, these movements are not included in the rail calculations. Instead, they are counted in the barge movements—the final mode used to transport the grain. There are other instances in which grain shipments are rebilled from one railroad to another at terminal markets. Such a movement would be considered a double-count of grain movements. An attempt is made to minimize the rebilled movements. Again, as with the rail-to-barge movements, these types of shipments represent a small portion of total rail shipments.

Rail Export. Export regions are defined by five-digit FIPS codes and are listed in Appendix B. The regions chosen are based on methodology from the 1998 modal share report as those regions with ports in the Pacific Northwest, Atlantic Coast, and Gulf of Mexico. Rail exports to the Great Lakes are determined from grain delivery information at Duluth-Superior, MN, and Toledo, OH. Total tonnages exported are then calculated using the designated export regions. Movements that originated and terminated in the same five-digit FIPS region are assumed to be short hauls, which would be double-counted and, thus, were deleted.

Rail Domestic. Domestic rail tonnages are estimated by subtracting export grain tonnages moved by rail from total grain tonnages moved by rail.

Barge Total. Annual barge movement data, which are collected and compiled by the U.S. Army Corps of Engineers, are obtained from Waterborne Commerce of the United States. The categories used to calculate modal shares for barge are river shipping range (origin) and river receiving range (destination). Total movements are determined by summing the total of all receiving ranges. As explained in the Rail Total section above, when barge and rail are used in combination to ship grain, with barge being the final mode in the transportation route, only the barge movement is included.

Barge Export. The following river receiving ranges are used to find barge export movements: Atlantic, Pacific, Central Gulf, East Gulf, and West Gulf. Any movement that is received into a port in the defined regions is determined to be an export movement. The receiving ranges are based on the 1998 report's methodology. For that report, export barge modal shares were calculated using barge export tonnages based on internal grain and oilseed receipts reported on the inland waterways. Movements were defined as those to: 1) Kalama and Vancouver, WA, and Portland, OR, on the Columbia-Snake River system; 2) Baton Rouge through New Orleans, LA, to the mouth of the passes on the Mississippi River system; 3) Lake Charles, LA, on the Calcasieu River; 4) Mobile, AL, on the Tennessee-Tombigbee River system; 5) Pascagoula, MS, on the Gulf Intracoastal Waterway; 6) Beaumont and Port Arthur, TX; 7) Galveston Bay (including Houston), TX; 8) Corpus Christi, TX, and the Gulf Intracoastal Waterway ports between Corpus Christi and the Mexican border; and 9) Hampton Roads and Norfolk, VA, on the Chesapeake Bay.

Barge Domestic. Domestic barge movements are calculated by subtracting export barge movements from total barge movements.

Truck Total. Total truck tonnages are estimated by subtracting total rail and total barge from total disappearance. The method for estimating truck grain tonnages and modal shares assumes that all barge and rail tonnages represent "long-haul" movements. "Short-haul" movements (farm-to-elevator) that originate on the farm are almost exclusively done by truck. Such farm-to-elevator movements are considered gathering movements. Unlike barge or rail movements that typically end at the point of domestic consumption or export, these truck movements represent only the first and shortest segment of the entire shipping route for grain.

Truck Export. Truck export tonnages are estimated by subtracting rail export and barge export tonnages from total export tonnages.

Truck Domestic. Domestic truck tonnages are estimated by subtracting domestic rail and domestic barge tonnages from total domestic tonnages.

Appendix B: FIPS Regions Included in Rail Export Tonnages

State/country	FIPS code	County
Canada & Mexico	0	All areas
Alabama	1003	Baldwin
Alabama	1097	Mobile
Arizona	4023	Santa Cruz
California	6025	Imperial
California	6073	San Diego
Georgia	13051	Chatham
Georgia	13127	Glynn
Louisiana	22019	Calcasieu
Louisiana	22023	Cameron
Louisiana	22033	East Baton Rouge
Louisiana	22051	Jefferson
Louisiana	22063	Livingston
Louisiana	22071	Orleans
Louisiana	22075	Plaquemines
Louisiana	22089	St. Charles
Louisiana	22093	St. James
Louisiana	22095	St. John the Baptist
Louisiana	22121	West Baton Rouge
Minnesota	27137	St. Louis
Mississippi	28045	Hancock
Mississippi	28047	Harrison
Mississippi	28059	Jackson
Ohio	39043	Erie
Ohio	39095	Lucas
Oregon	41009	Columbia
Oregon	41051	Multnomah
South Carolina	45019	Charleston
South Carolina	45053	Jasper
Texas	48061	Cameron
Texas	48141	El Paso
Texas	48167	Galveston
Texas	48201	Harris
Texas	48245	Jefferson
Texas	48323	Maverick
Texas	48355	Nueces
Texas	48361	Orange
Texas	48377	Presidio
Texas	48409	San Patricio
Texas	48479	Webb
Virginia	51710	Norfolk
Washington	53011	Clark
Washington	53015	Cowlitz
Washington	53033	King
Washington	53053	Pierce
Wisconsin	55031	Douglas
Wisconsin	55079	Milwaukee